APPENDIX A
Habitat Equivalency Analyses

Table A-1: HEA effective acreage gained from recovery of low-relief hardbottoms

Assumptions: dredging leaves 10% service, w/ linear increase

Year	% Service Level	% Service Loss	Effective Ac lost	Discount Factor	Discount Off ac lost
2003	10.00%	90.00%	0.60	0.97	0.58
2004	17.50%	82.50%	0.50	0.94	0.47
2005	25.00%	75.00%	0.45	0.91	0.41
2006	32.50%	67.50%	0.41	0.88	0.36
2007	40.00%	60.00%	0.36	0.85	0.30
2008	47.50%	52.50%	0.32	0.82	0.26
2009	55.00%	45.00%	0.27	0.79	0.21
2010	62.50%	37.50%	0.23	0.76	0.17
2011	70.00%	30.00%	0.18	0.73	0.13
2012	77.50%	22.50%	0.14	0.70	0.09
2013	85.00%	15.00%	0.09	0.67	0.06
2014	92.50%	7.50%	0.05	0.64	0.03
2015	100.00%	0.00%	0.00	0.61	0.00

Total effective-acre years/ac: 3.07

Table A-2: HEA effective acreage gained from recovery of low-relief hardbottoms

Assumptions: 20% service immediate, w/ linear increase

Year	% Service Level	% Service Increase	Discount Factor	Discount Eff ac gain
2003	20.00%	0.00%	1.00	0.00
2004	26.67%	6.67%	0.97	0.06
2005	33.33%	13.33%	0.94	0.13
2006	40.00%	20.00%	0.91	0.18
2007	46.67%	26.67%	0.88	0.23
2008	53.33%	33.33%	0.85	0.28
2009	60.00%	40.00%	0.82	0.33
2010	66.67%	46.67%	0.79	0.37
2011	73.33%	53.33%	0.76	0.41
2012	80.00%	60.00%	0.73	0.44
2013	86.67%	66.67%	0.70	0.47
2014	93.33%	73.33%	0.67	0.49
2015	100.00%	80.00%	0.64	0.51

Total effective-acre years/ac: 3.90

Table A-3: HEA acreage calculation for low-relief hardbottom compensation

Impact area	0.6
Present discounted interim losses	3.07
Present discounted lifetime gains per acre of replacement project	3.9
R= # acres required for compensation	
3.07=3.9*R	
R=	3.07/3.9
R=	0.787179

Effective mitigation to compensation ratio: 1.316667

Table A-4: HEA effective acreage lost from impacts to high-relief reefs

Assumptions: dredging leaves 10% service, w/ linear increase

Year	% Service Level	% Service Loss	Effective Ac lost	Discount Factor	Discount Eff ac lost
2003	10.00%	90.00%	2.70	0.97	2.62
2004	13.00%	87.00%	2.35	0.94	2.21
2005	16.00%	84.00%	2.27	0.91	2.06
2006	19.00%	81.00%	2.19	0.88	1.92
2007	22.00%	78.00%	2.11	0.85	1.78
2008	25.00%	75.00%	2.03	0.82	1.65
2009	28.00%	72.00%	1.94	0.79	1.53
2010	31.00%	69.00%	1.86	0.76	1.41
2011	34.00%	66.00%	1.78	0.73	1.29
2012	37.00%	63.00%	1.70	0.70	1.19
2013	40.00%	60.00%	1.62	0.67	1.08
2014	43.00%	57.00%	1.54	0.64	0.98
2015	46.00%	54.00%	1.46	0.61	0.88
2016	49.00%	51.00%	1.38	0.58	0.79
2017	52.00%	48.00%	1.30	0.55	0.71
2018	55.00%	45.00%	1.22	0.52	0.63
2019	58.00%	42.00%	1.13	0.49	0.55
2020	61.00%	39.00%	1.05	0.46	0.48
2021	64.00%	36.00%	0.97	0.43	0.41
2022	67.00%	33.00%	0.89	0.40	0.35
2023	70.00%	30.00%	0.81	0.37	0.30
2024	73.00%	27.00%	0.73	0.34	0.25
2025	76.00%	24.00%	0.65	0.31	0.20
2026	79.00%	21.00%	0.57	0.28	0.16
2027	82.00%	18.00%	0.49	0.25	0.12
2028	85.00%	15.00%	0.40	0.22	0.09
2029	88.00%	12.00%	0.32	0.19	0.06
2030	91.00%	9.00%	0.24	0.16	0.04
2031	94.00%	6.00%	0.16	0.13	0.02
2032	97.00%	3.00%	0.08	0.10	0.01
2033	100.00%	0.00%	0.00	0.07	0.00
			Total effective-acre years/ac:		25.76

Table A-5: HEA effective acreage gained from recovery of high-relief reefs

Assumptions: 20% service immediate, w/ linear increase

Year	% Service Level	% Service Increase	Discount Factor	Discount Eff ac gain
2003	20.00%	0.00%	1.00	0.00
2004	22.67%	2.67%	0.97	0.03
2005	25.33%	5.33%	0.94	0.05
2006	28.00%	8.00%	0.91	0.07
2007	30.67%	10.67%	0.88	0.09
2008	33.33%	13.33%	0.85	0.11
2009	36.00%	16.00%	0.82	0.13
2010	38.67%	18.67%	0.79	0.15
2011	41.33%	21.33%	0.76	0.16
2012	44.00%	24.00%	0.73	0.18
2013	46.67%	26.67%	0.70	0.19
2014	49.33%	29.33%	0.67	0.20
2015	52.00%	32.00%	0.64	0.20
2016	54.67%	34.67%	0.61	0.21
2017	57.33%	37.33%	0.58	0.22
2018	60.00%	40.00%	0.55	0.22
2019	62.67%	42.67%	0.52	0.22
2020	65.33%	45.33%	0.49	0.22
2021	68.00%	48.00%	0.46	0.22
2022	70.67%	50.67%	0.43	0.22
2023	73.33%	53.33%	0.40	0.21
2024	76.00%	56.00%	0.37	0.21
2025	78.67%	58.67%	0.34	0.20
2026	81.33%	61.33%	0.31	0.19
2027	84.00%	64.00%	0.28	0.18
2028	86.67%	66.67%	0.25	0.17
2029	89.33%	69.33%	0.22	0.15
2030	92.00%	72.00%	0.19	0.14
2031	94.67%	74.67%	0.16	0.12
2032	97.33%	77.33%	0.13	0.10
2033	100.00%	80.00%	0.10	0.08
			Total effective-acre years/ac:	4.84

Table A-6: HEA acreage calculation for high-relief compensation

Injured area	2.7
Present discounted interim losses	25.76
Present discounted lifetime gains per acre of replacement project	4.84

R= # acres required for compensation

25.76=4.84*R

R= 25.76/4.84

R= 5.322314

Effective mitigation to compensation ratio: 1.971227

APPENDIX B

Mitigation Options Fact Sheets

Name: Old King's Bay Landfill, Chapman Field
Owner: Dade County
Location: Southeast portion of Chapman Field area in mangrove wetlands.
Manager: Metro-Dade Parks & Recreation, Natural Areas Management Division
Contact Person: Joe Maguire, Supervisor
Brief Project Description: Recover landfill and restore area to mangrove wetlands
Target Habitat: Tidal mangrove wetlands Estimated Acreage: 10.95 acres
Credit Type: Restoration Likelihood of Success: High
Procedure: The boundaries of the old landfill would need to be mapped as closely as possible. This would require some surveying and perhaps investigative borings around the edges. Investigative borings would need to be taken in and around the landfill for the purpose of determining the depth of the landfill and the nature and depth of underlying substrate. Any oral or written history of the landfill should also be obtained and reviewed as well as results of recent water quality monitoring. It is currently thought that the landfill contains only domestic waste that could be approved for disposal at the existing South Dade facility. However, in order to be hauled off site, DERM policy may require that the material be handled as hazardous or contaminated waste. If that is the case, the project would probably be cost prohibitive at this point. The only practical alternative to hauling the waste off site would be to restore only a portion of the landfill and transfer that waste to the remaining area of landfill and leave it on site.

In any case, the construction procedure would be as follows: The vegetation would first need to be cleared from the restoration area and hauled off. The landfill material would be removed in a phased approach and hauled to its final destination. The final elevation resulting from complete landfill excavation is expected to be lower than that of the surrounding mangrove wetlands. In this case, the site will need to be brought up to grade with clean fill material. Once the target elevation is achieved, mangrove revegetation can occur. There is an abundant surrounding seed source, but if planting is required, rooted propagules of red mangroves (*Rhizophora mangle*) would be installed on five foot centers. A reasonable period of monitoring and maintenance (three years) would follow to ensure that established success criteria are achieved.
Schedule: If the entire landfill is removed, this project is expected to take over two years to complete.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (landfill), removal of an invasive exotic plant seed source and expansion of tidal mangrove habitat for wildlife using this area including the American crocodile (*Crocodylus acutus*).

Name: Small Fill Pad South of Road, Chapman Field
Owner: Dade County
Location: Chapman Field area, south of paved road
Manager: Metro-Dade Parks & Recreation, Natural Areas Management Division
Contact Person: Joe Maguire, Supervisor
Brief Project Description: Australian pine treatment and selective fill removal to allow mangrove wetlands recovery
Target Habitat: Tidal mangrove wetlands Estimated Acreage: 1.65 acres

Credit Type: Restoration Likelihood of Success: High
Procedure: The goal for this site is to accelerate the natural recovery already taking place around the edges. Site planning would mostly involve mapping the edges of the fill and the areas of slightly lower elevation along the edges where white mangroves (*Laguncularia racemosa*) are recruiting now. The main objective would be to remove just enough fill and rocky material from selected areas (especially near the center) to encourage further recruitment by mangroves. First the invasive exotic vegetation would be removed and/or treated with herbicides. Then rocky fill material would be removed in selected areas to appropriate elevations for mangrove recruitment. Then the site would simply be left to revegetate. Planting is not recommended for this site, but the cost is included below in case it is required by resource agencies. A reasonable period of monitoring and maintenance (three years) would follow to ensure that established success criteria are achieved.
Schedule: This project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (eroding fill), removal of an invasive exotic plant seed source and expansion of tidal mangrove habitat for wildlife using this area including the American crocodile.

Name: Old Plant Nursery, Chapman Field
Owner: Dade County
Location: Northwest portion of Chapman Field area, north of road and just west of pond.
Manager: Metro-Dade Parks & Recreation, Natural Areas Management Division
Contact Person: Joe Maguire, Supervisor
Brief Project Description: Scrape down to grassy brackish marsh habitat
Target Habitat: Brackish Marsh
Estimated Acreage: 8.55 acres of marsh creation and 4.49 acres enhancement
Credit Type: Creation of marsh; Enhancement of marsh and mangroves.
Likelihood of Success: Moderate for creation; High for enhancement
Procedure: This is the site of the old Coral Gables landfill. Its most recent use was for a plant nursery, hence the site name. The boundaries of the fill site would need to be mapped as closely as possible. This would require some surveying and perhaps investigative borings around the edges. Investigative borings would need to be taken within the site as well to determine the extent and composition of the landfill and also to determine the nature and depth of the underlying natural substrate. Any oral or written history of the landfill should also be obtained and reviewed. If the landfill contains only domestic waste it could be approved for disposal at the existing South Dade facility. However, in order to be hauled off site, DERM policy may require that the material be handled as hazardous or contaminated waste. If that is the case, the project would probably be cost prohibitive at this point. The only practical alternative to hauling the waste off site would be to restore only a portion of the landfill and transfer that waste to the remaining area of landfill and leave it on site.

Another factor that must be considered for this site is Dade County's desire to use some of it as park land. This preliminary analysis assumes that they will want to retain about 4.49 acres near the existing entrance road as park land. Coordination with the county on

this issue would take place during site planning. It is assumed for this analysis that whatever area of fill is left in place would serve as an enhancement project consisting of exotic plant eradication.

In any case, the construction procedure would be as follows: The vegetation would first need to be cleared from the restoration area and hauled off. The landfill material would be removed in a phased approach and hauled to its final destination. The final elevation resulting from complete landfill excavation may be lower than that of the surrounding mangrove wetlands. In this case, the site will need to be brought up to the proper elevation with suitable clean material for brackish marsh habitat. It is assumed that planting of marsh grasses would be required for this site. Once plants are installed, a three year period of monitoring and maintenance would follow.
Schedule: If the entire landfill is removed the project is expected to take over two years to complete.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (eroding fill), removal of an invasive exotic plant seed source (several listed pest plant species occur on this site) and expansion of brackish marsh habitat for wildlife using this area including the American crocodile. This project would also have an added educational benefit as a public park.

Name: East Culvert Replacement, Chapman Field
Owner: Dade County
Location: East end of road at Chapman Field where tidal creek enters pond.
Manager: Metro-Dade Parks & Recreation, Natural Areas Management Division
Contact Person: Joe Maguire, Supervisor
Brief Project Description: Replace dilapidated east culvert.
Target Habitat: Mangroves, tidal lagoon Estimated Acreage: 48 acres
Credit Type: Enhancement Likelihood of Success: High
Procedure: The hydrology at the site would first need to be evaluated to ensure proper sizing of culverts. A culvert large enough to allow passage by crocodiles would probably be adequate for proper tidal exchange. Culverts would be designed to minimize the need for future maintenance. Construction simply involves removal of the overlying road and existing culvert, placement of a new culvert and replacement of the roadway. It is assumed that Dade County will want the old asphalt disposed of in the landfill and the roadway to be repaved after culvert installation. Follow-up monitoring for water level and flow would be conducted for one year.
Schedule: This project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including improvement of tidal circulation and water exchange and expansion of submerged habitat and movement corridors for fish and wildlife using this area including the American crocodile.

Name: Middle Culvert Installation, Chapman Field
Owner: Dade County
Location: Approximately halfway down paved road to Chapman Field.
Manager: Metro-Dade Parks & Recreation, Natural Areas Management Division
Contact Person: Joe Maguire, Supervisor

Brief Project Description: Install culvert to connect west end of lagoon to ditch across road
Target Habitat: Mangroves, tidal lagoon Estimated Acreage: 48 acres
Credit Type: Enhancement Likelihood of Success: High
Procedure: The hydrology at the site would first need to be evaluated to ensure proper sizing of culverts. A culvert large enough to allow passage by crocodiles would probably be adequate for proper tidal exchange. Culverts would be designed to minimize the need for future maintenance. Construction simply involves removal of the overlying road and existing culvert, placement of a new culvert and replacement of the roadway. It is assumed that Dade County will want the old asphalt disposed of in the landfill and the roadway to be repaved after culvert installation. Follow-up monitoring for water level and flow would be conducted for one year.
Schedule: This project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including improvement of tidal circulation and water exchange and expansion of submerged habitat and movement corridors for fish and wildlife using this area including the American crocodile.

Name: West Culvert Installation/Spoil Bank Removal, Chapman Field and R. Hardy Matheson South Tract
Owner: Dade County
Location: Near west end of paved road to Chapman Field, just west of Old Plant Nursery project site.
Manager: Metro-Dade Parks & Recreation, Natural Areas Management Division
Contact Person: Joe Maguire, Supervisor
Brief Project Description: Install culvert west of old nursery to connect existing tidal channel to brackish marsh across road; remove blockages to tidal water (ditch spoil paths).
Target Habitat: Mangroves, tidal marsh Estimated Acreage: 55 acres
Credit Type: Enhancement Likelihood of Success: High
Procedure: The hydrology at the site would first need to be evaluated to ensure proper sizing of culverts. A culvert large enough to allow passage by crocodiles would probably be adequate for proper tidal exchange. Culverts would be designed to minimize the need for future maintenance. Construction simply involves removal of the overlying road and existing culvert, placement of a new culvert and replacement of the roadway. It is assumed that Dade County will want the old asphalt disposed of in the landfill and the roadway to be repaved after culvert installation. Existing spoil mounds from ditching in the marsh would be breached at appropriate points to allow maximum tidal exchange. The work would need to be done by hand and the resulting fill material could be spread over the remaining spoil mound segments. Follow-up monitoring for water level and flow at the culvert site and in the marsh would be conducted for one year.
Schedule: This project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including improvement of tidal circulation and water exchange and expansion of submerged habitat and movement corridors for fish and wildlife using this area including

the American crocodile. Improved tidal exchange is expected to enhance surrounding brackish marsh habitat.

Name: Exotics Eradication,
Chapman Field and R. Hardy Matheson South Tract
Owner: Dade County
Location: Chapman Field area and tract to the north of it.
Manager: Metro-Dade Park & Recreation, Natural Areas Management Division
Contact Person: Joe Maguire, Supervisor
Brief Project Description: Remove and/or treat exotics in all areas of Chapman Field and R. Hardy Matheson South Tract that are not restoration project areas (roads in and immediately surrounding tracts, existing brackish marsh, active park land, area between subdivision and park)
Target Habitat: Mangroves, tidal marsh Estimated Acreage: 40.83
Credit Type: Enhancement Likelihood of Success: High
Procedure: The goal of this project would be to eliminate exotic vegetation seed sources immediately surrounding the various potential restoration projects. The largest stands are along the roads and between the existing Chapman Field Park and the subdivision. Most of these would be removed but herbicide treatment of standing trees would be appropriate for selected areas. As long as these areas remain filled, exotic vegetation will recruit from surrounding seed sources on private lands. Therefore there will always be a need for monitoring and control of exotics. It is recommended that maintenance be conducted under this project for a period of three years to ensure complete eradication of regrowth on site. Annual maintenance can then turned over to the managing authority.
Schedule: This project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a major invasive exotic seed source and encouragement of native vegetation. This project would be a major enhancement to the overall mangrove/brackish marsh community resulting in direct wildlife benefits.

Name: Main Fill Pad, Chapman Field
Owner: Dade County
Location: Northeast portion of Chapman Field area at the end of the paved road.
Manager: Metro-Dade Park & Recreation, Natural Areas Management Division
Contact Person: Joe Maguire, Supervisor
Brief Project Description: Remove a portion of the main fill pad and scrape down to mangrove wetlands; eradicate exotics from main fill pad.
Target Habitat: Mangroves Estimated Acreage: (total area is 19.4)
Credit Type: Restoration, Enhancement Likelihood of Success: High
Procedure: Procedure: This is the site of the old Dade County landfill. The fill pad is 19.4 acres in size. Dade County has set aside the area to use for park land but some small habitat areas have been restored and further restoration area may be available. Coordination with the county would be needed to determine how much, if any, of this site is available for restoration. The goal of this project would be to scrape down a portion of the existing fill pad for restoration of mangrove wetlands. The boundaries of the fill site would need to be mapped as closely as possible. This would require some surveying and

perhaps investigative borings around the edges. Investigative borings would need to be taken within the site as well to determine the extent and composition of the landfill and also to determine the nature and depth of the underlying natural substrate. Any oral or written history of the landfill should also be obtained and reviewed. If the landfill contains only domestic waste it could be approved for disposal at the existing South Dade facility. However, in order to be hauled off site, DERM policy may require that the material be handled as hazardous or contaminated waste. If that is the case, the project would probably be cost prohibitive at this point. The only practical alternative to hauling the waste off site would be to restore only a portion of the landfill and transfer that waste to the remaining area of landfill and leave it on site. Exotics on the remaining uplands would also be eradicated to enhance the area. There is a remote possibility of installing nesting area for American crocodiles if it can be accommodated outside a fenced park site.

In any case, the construction would proceed as follows. The vegetation would first need to be cleared from the restoration area and hauled off. The required portion of landfill material would be removed in a phased approach and hauled to its final destination. The final elevation resulting from complete landfill excavation may be lower than that of the surrounding mangrove wetlands. In this case, the site will need to be brought up to the proper elevation with suitable clean material for mangrove habitat. A three year period of monitoring and maintenance would follow construction.
Schedule: This project can be permitted and completed within two years depending on size of restoration area.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (eroding fill), removal of an invasive exotic plant seed source and expansion of mangrove wetland habitat for wildlife using this area including the American crocodile. This project would also have an added educational benefit as a public park.

Name: Old South Dade Landfill
Owner: Dade County
Location: Across the street from the operating South Dade landfill.
Manager: Dade County Department of Solid Waste Management
Contact Person: Steve Christensen
Brief Project Description: Fill created waterbody and plant marsh
Target Habitat: High marsh Estimated Acreage: 20 acres
Credit Type: Restoration Likelihood of Success: Moderate to High
Procedure: This restoration area is at the old South Dade landfill site. The Miami-Dade County Department of Solid Waste Management (SWM) has had the solid waste removed and the site is now a "pond" with depths of 3 to 5 feet below grade. The site would need to be brought up to grade with clean fill material appropriate for marsh restoration. SWM staff are currently monitoring a series of experimental plantings installed this year over 8 acres to determine what types of marsh vegetation are mostly likely to survive and create a viable habitat. A planting design for the 20-acre restoration site would be based mostly on their results and recommendations for the site. For preliminary cost estimates it will be assumed that marsh grass plugs will be planted on

five foot centers over the entire 20 acres. Monitoring and maintenance would cover at least three years but may need to be longer if a second planting is required.
Schedule: The project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (landfill), removal of an invasive exotic plant seed source and expansion of tidal marsh habitat for wildlife using this area.

Name: Marine Stadium Fill Removal, Virginia Key
Owner: Dade County and City of Miami
Location: Northeast area of Virginia Key directly across boat basin from the Miami Marine Stadium.
Manager:
Contact Person: Craig Grossenbacher
Brief Project Description: Scrape down and remove fill from pads and part of existing road
Target Habitat: Mangroves, seagrass, marsh Estimated Acreage: 19.55 acres
Credit Type: Restoration, Creation
Likelihood of Success: High for restoration; Moderate for creation
Procedure: The project is located across the boat basin from the old marine stadium on Virginia Key. The goal of this project is to restore several old fill pads and remove a portion of the end of the road. The fill pads can be restored to mangrove wetlands but one or two of them may be good candidates for brackish marsh creation. It is possible that seagrass habitat can be restored with the removal of a portion of the road but further site investigation is necessary to determine this. The main project tasks would basically entail eradication of exotics and fill removal to proper elevations.
Schedule: This project can be permitted and completed within one to 1.5 years depending on scope.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (eroding fill), removal of an invasive exotic plant seed source and expansion of seagrass and wetland habitat for wildlife using this area.

Name: Virginia Key Impounded Wetlands
Owner: Dade County and City of Miami
Location: Southwest portion of Virginia Key just off the Rickenbacker Causeway and south of Sewage Plant Road.
Manager:
Contact Person: Craig Grossenbacher
Brief Project Description: Scrape down scattered fill and eradicate exotics where appropriate
Target Habitat: Freshwater forested wetlands Estimated Acreage: 48.13 acres
Credit Type: Enhancement Likelihood of Success: Moderate
Procedure: This project would require extensive site review and design. The first task would be to define the target habitat and plan the approach to achieve it. Construction would entail two main tasks: Cutting and treating of exotics throughout the area, and,

removal of fill from selected areas. Certain construction and maintenance problems would need to be addressed. One or more temporary access roads would be needed for fill or exotics removal. For purposes of this preliminary assessment, we will assume that two temporary access roads would be needed. Fill removal would be planned for selected areas of higher elevation with heavy exotic vegetation. Cutting, removal and treatment methods could be used for exotics over the remainder of the site. The site is probably all jurisdictional and flooded a large part of the time. This would increase the usual cost per acre of herbicide treatment. The procedure for exotics eradication would probably involve cutting paths for access throughout the site to allow for both removal and herbicide treatment. Once all work is finished at the site, the temporary fill roads would then be removed down to the original grade. It is not recommended that planting be considered at this point without further study of the site. Monitoring and maintenance of this site should occur over three years and then be turned over to the managing authority. Exotics will continue to be a problem here due to surrounding seed sources and remaining fill areas on the site. It is unclear at this point whether the City of Miami is interested in restoration of the wetlands that extend onto their property. If they are not, the property line would need to be surveyed and marked on site to indicate project boundaries.
Schedule: This project can be permitted and completed within two years.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (eroding fill), removal of a large invasive exotic plant seed source and expansion of native forested wetland habitat for wildlife using this area.

Name: Sewage Treatment Plant East
Owner: City of Miami
Location: Northeast area of Virginia Key directly opposite the sewage treatment plant.
Manager:
Contact Person:
Brief Project Description: Eradicate exotics and scrape down fill
Target Habitat: Tidal mangroves Estimated Acreage: 6.9 acres
Credit Type: Restoration, Creation, Enhancement
Likelihood of Success: High
Procedure: The goal of this project is to remove fill for restoration of about 0.77 acres of mangroves and to enhance the restoration area and existing mangroves by removing invasive exotics and creating an upland buffer. The fill area is right on the shoreline and is easily accessibly from an existing road but would require turbidity control due to the strong currents in the area. The exotics eradication and upland buffer creation would take place in the area between the road and the existing mangroves. This area would require constant control of exotics until the native buffer is well established.
Schedule: This project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (eroding fill), removal of an invasive exotic plant seed source and creation of native buffer habitat for wildlife using this area.

Name: Sewage Treatment Plant West
Owner: Dade County
Location: Northwest area of Virginia Key directly opposite the sewage treatment plant.
Manager:
Contact Person: Craig Grossenbacher
Brief Project Description: Eradicate exotics and remove fill
Target Habitat: Tidal mangroves Estimated Acreage: 7 acres
Credit Type: Restoration Likelihood of Success: High
Procedure: The main goal of this project is to eradicate exotics and remove a fill spit that apparently runs alongside an old channel to Virginia Key. The channel has obviously not been used for a long time and it should be confirmed with Dade County that it is indeed no longer needed. Construction tasks would include exotics eradication and removal from the filled and from the area surrounding the site. The fill would then be scraped down to mangrove elevations and possibly disposed of back into the channel. Access seems fairly good and turbidity control would not be a problem in this area.
Schedule: This project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (eroding fill), removal of an invasive exotic plant seed source and expansion of mangrove wetland habitat for wildlife using this area.

Name: Virginia Key Spoil Islands
Owner: Dade County
Location: Islands just north of Virginia Key.
Manager:
Contact Person: Craig Grossenbacher
Brief Project Description: Eradicate exotics and create hammock, transitional and mangrove habitat on existing spoil islands.
Target Habitat: To be determined Estimated Acreage: unknown (2 islands)
Credit Type: Creation Likelihood of Success: Low to Moderate
Procedure: DERM has suggested possible creation of some type of native coastal hammock habitat for these two islands, primarily the larger of the two. Preliminary information has not been obtained for this project at this time. The basic tasks would most likely involve removal of the invasive exotics from the island, alteration of the site to the extent needed to provide proper conditions for native habitat, and installation of native plantings at the appropriate elevations. Another possibility for old spoil islands is creation of shorebird nesting and resting habitat. A third and more ambitious possibility is complete scrapedown of these islands to seagrass habitat with deposition of the material back into the adjacent channel for additional seagrass habitat. A reasonable monitoring and maintenance period, at least three years, would be required, depending on the nature of the project. (Note: It has not been confirmed at this point that these islands are entirely spoil islands).
Schedule: This project can be permitted and completed within two years.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of a source of water quality degradation (eroding fill), removal of an

invasive exotic plant seed source and expansion of native habitat for wildlife using this area.

Name: Virginia Beach Hammock
Owner: City of Miami
Location: Northeast shoreline of Virginia Key (at Virginia Beach)
Manager:
Contact Person: Craig Grossenbacher
Brief Project Description: Restoration of coastal beach berm hammock
Target Habitat: Coastal hammock Estimated Acreage: unknown
Credit Type: Restoration Likelihood of Success: High
Procedure: The City and Miami-Dade County are currently jointly undertaking the restoration of coastal hammock on the east shore of Virginia Key in the area known as Virginia Beach. The goal of this project would be to participate in or fund a portion of that upland hammock restoration. The site may be eligible for some wetland enhancement credit through restoration of uplands adjacent to existing wetlands. The project mainly involves invasive exotic removal and installation of native trees. Little or no topographic alteration is needed.
Schedule: This project can be permitted and completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of an invasive exotic plant seed source and expansion of native habitat for wildlife using this area.

Name: Critical Wildlife Area and Biscayne Aquatic Preserve Seagrass Restoration
Owner: State of Florida
Location: CWA is in Miami Harbor adjacent to and just south of the Port of Miami.
Manager: FFWCC/Aquatic Preserves
Contact Person: FFWCC: Ricardo Zambrano; Aquatic Preserve: David Mayer
Brief Project Description: Restoration of boat grounding or propeller scar sites to seagrass habitat.
Target Habitat: Seagrass habitat Estimated Acreage: unknown
Credit Type: Restoration Likelihood of Success: Moderate to High
Procedure: The basic goal is to locate and restore problem grounding and propeller scar sites within the CWA and Biscayne Bay Aquatic Preserve. Candidate sites would be located and investigated in the field. Techniques that could possibly be used to implement restoration would include possible filling of deep holes and scars, planting of seagrass and/or use of the bird stake fertilization technique. Monitoring and maintenance would be required for at least 2-3 years depending on the techniques used.
Schedule: This project can be permitted and completed within two years.
Additional Benefits: This project is expected to benefit natural resources through the direct restoration of seagrass habitat in the bay and removal of continued erosion and sedimentation from expanding grounding and prop scar sites.

Name: Biscayne National Park Seagrass Restoration
Owner: United States of America
Location: Southern portion of Biscayne National Park
Manager: Biscayne National Park

Contact Person: Rick Clark
Brief Project Description: Restoration of boat grounding or propeller scar sites to seagrass habitat.
Target Habitat: Seagrass habitat
Estimated Acreage: unknown
Credit Type: Restoration
Likelihood of Success: High
Procedure: Biscayne National Park has an active restoration project in progress at this time and has expressed interest in receiving mitigation fees or restoration participation from permittees. The basic goal is to locate and restore problem grounding and propeller scar sites within the park. Park staff has already identified candidate sites for restoration that would need to be investigated in the field. Techniques that could possibly be used to implement restoration would include possible filling of deep holes and scars, planting of seagrass and/or use of the bird stake fertilization technique. Monitoring and maintenance would be required for at least 2-3 years depending on the techniques used.
Schedule: This project can be permitted and completed within two years.
Additional Benefits: This project is expected to benefit natural resources through the direct restoration of seagrass habitat in the bay and removal of continued erosion and sedimentation from expanding grounding and prop scar sites.

Name: Environmentally Endangered Lands (EEL) Program
Owner: (Private Owners)
Location: Various locations along the shoreline of Biscayne Bay.
Manager: Dade County would be land manager upon receipt of title
Contact Person: Emilie Young
Brief Project Description: Purchase coastal wetlands and/or uplands adjacent to Biscayne Bay for preservation.
Target Habitat: Coastal wetlands and uplands
Estimated Acreage: See Table 1.
Credit Type: Preservation
Likelihood of Success: High
Procedure: There are several tracts on the EEL list but those that would be especially valuable by preserving habitat adjacent to the bay include: Hardy Matheson Addition, Cutler Wetlands, Black Point Wetlands, Biscayne Wetlands, Deering Estate North and Vizcaya Hammock. Acreages for these are given in Table 1. The first four consist primarily of wetlands. The habitat at Deering Estate North is unknown but probably includes wetlands. Vizcaya Hammock includes primarily uplands.
Schedule: This project can be completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways by preserving and making available for management large tracts of native habitat adjacent to the bay.

Name: Oleta River State Park
Owner: State of Florida
Location: Scattered mangrove restoration sites within the park.
Manager: Florida Department of Environmental Protection, Division of Parks and Recreation
Contact Person: John Robinson, Park Manager; Craig Grossenbacher, DERM
Brief Project Description: Scrape and fill to mangrove wetlands
Target Habitat: Mangroves
Estimated Acreage: 7 - 10
Credit Type: Restoration
Likelihood of Success: unknown

Procedure: There is a large restoration project already underway at Oleta River which involves restoration of tidal mangrove habitat. This project would involve scrapedown of remnant sites in the park that were not included within that larger project. There are approximately 7 to 10 acres available for restoration to mangrove wetlands. These sites have not been investigated in detail.
Schedule: This project can be completed within one year.
Additional Benefits: This project is expected to benefit natural resources in several ways including removal of water quality degradation sources (eroding fill), removal of invasive exotic plant seed source and expansion of tidal wetland wildlife habitat.

Chapman Field

Mitigation Option Fact Sheet

Middle Culvert Replacement
-Remove existing road and culvert
-Provide new culvert, elliptical type
-Provide new roadway
-Provide ditch on both sides of culvert
-Monitoring water level at culvert for one year
Probable cost: $73,681

East Culvert
-Remove existing road and culvert
-Provide new culvert, elliptical type
-Provide new roadway
-Provide ditch on both sides of culvert
-Monitoring water level at culvert for one year
Probable cost: $73,714

West Culvert Replacement
-Remove existing road and culvert
-Provide new culvert, elliptical type
-Provide new roadway
-Provide ditch on both sides of culvert
-Monitoring water level at culvert for one year
Probable cost: $73,681

Legend

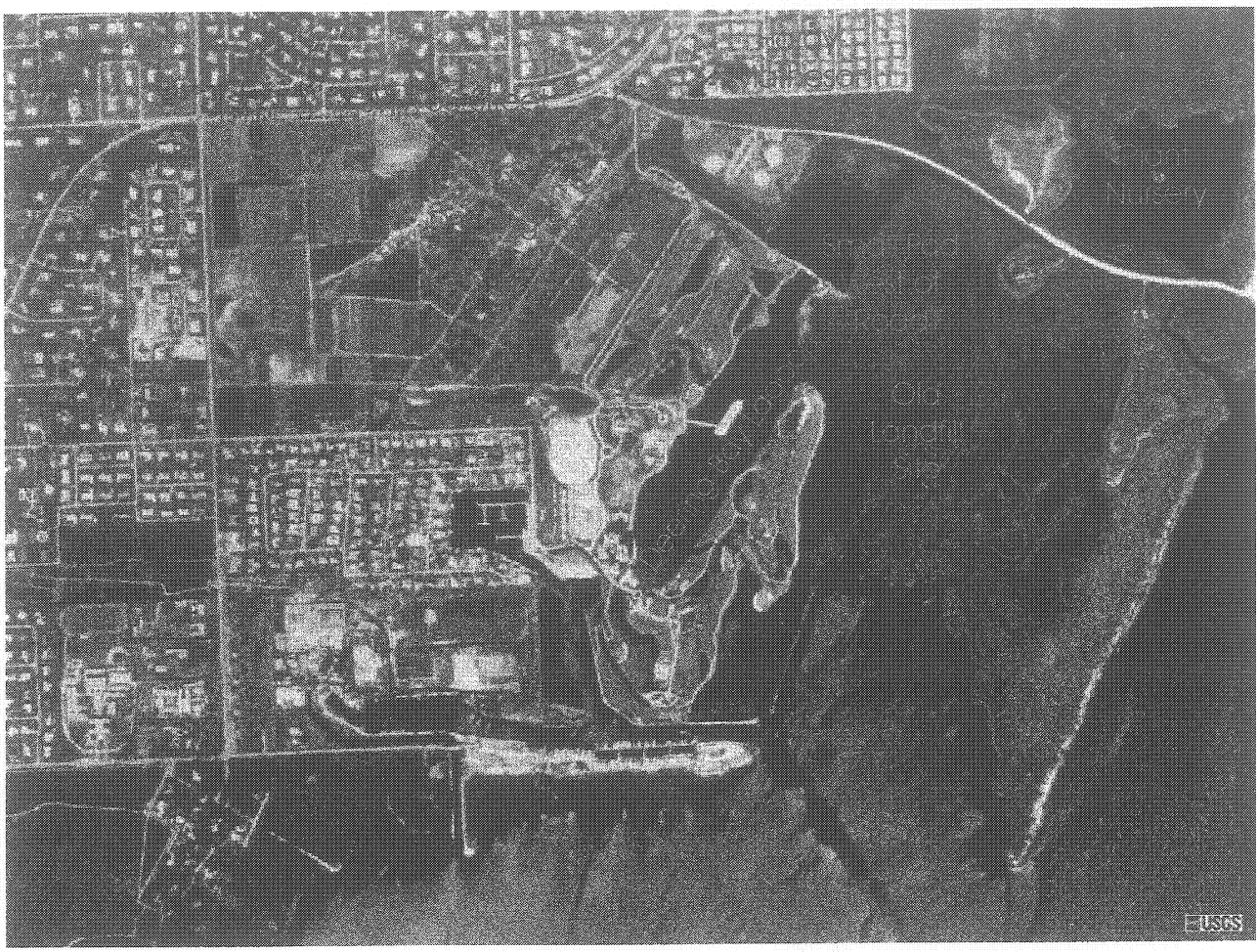
Possible Mitigation Sites

Possible Mitigation Site - Chapman Field

Dante B. Fascell Miami-Dade Seaport

FILENAME: W/99-01/graphics/063000.Chapman Field.Culverts

Source: The Curtis & Kimball Company, June 2000



Chapman Field

Mitigation Option Fact Sheet

Old Landfill
-Site surveying, 13.55 acres
-Provide a temporary access road
-Site clearing, remove vegetation
-Excavation clear to 5' deep, haul and dump excavated material
-Fill up to 2' entire site with clean material
-Site maintenance and herbicide treatment for three years
Probable cost: $5,821,904
Cost per acre: $430,000

Middle Culvert Replacement
-Remove existing road and culvert
-Provide new culvert, elliptical type
-Provide new roadway
-Provide ditch on both sides of culvert
-Monitoring water level at culvert for one year
Probable cost: $73,681

West Culvert Replacement
-Remove existing road and culvert
-Provide new culvert, elliptical type
-Provide new roadway
-Provide ditch on both sides of culvert
-Monitoring water level at culvert for one year
Probable cost: $73,681

Old Plant Nursery
-Site surveying, 12.97 acres
-Provide a temporary access road
-Site clearing, remove vegetation
-Excavation clear to 5' deep of existing landfill material, haul and dump material
-Leave as is, smooth clear
-Site maintenance and herbicide treatment for three years
Probable cost: $3,648,827
Cost per acre: $280,000

East Culvert
-Remove existing road and culvert
-Provide new culvert, elliptical type
-Provide new roadway
-Provide ditch on both sides of culvert
-Monitoring water level at culvert for one year
Probable cost: $73,714

Small Pad Fill West of Road
-Site surveying, 4.28 acres
-Provide temporary access road
-Site clearing, remove vegetation
-Excavation clear to 3' deep of existing landfill material, haul and dump material
-Leave as is, smooth clean
-Site maintenance and herbicide treatment for three years
Probable cost: $413,302
Cost per acre: $

Hardy Matheson South Tract
-Site surveying, 40.83 acres
-Exotics eradication
-Provide temporary road access
-Provide deep ditches
-Site maintenance and herbicide treatment for three years
Probable cost: $387,075
Cost per acre: $

Legend

Possible Mitigation Sites

Possible Mitigation Site - Chapman Field

Dante B. Fascell Miami-Dade Seaport

FILENAME: W/99-01/graphics/061400.Chapman Field

Source: The Curtis & Kimball Company, June 2000

Chapman Field

Mitigation Option Fact Sheet

Hardy Matheson South Tract
-Site surveying, 40.83 acres
-Exotics eradication
-Provide temporary road access
-Provide deep ditches
-Site maintenance and herbicide treatment for three years
Probable cost: $387,075
Cost per acre: $9,500

Legend

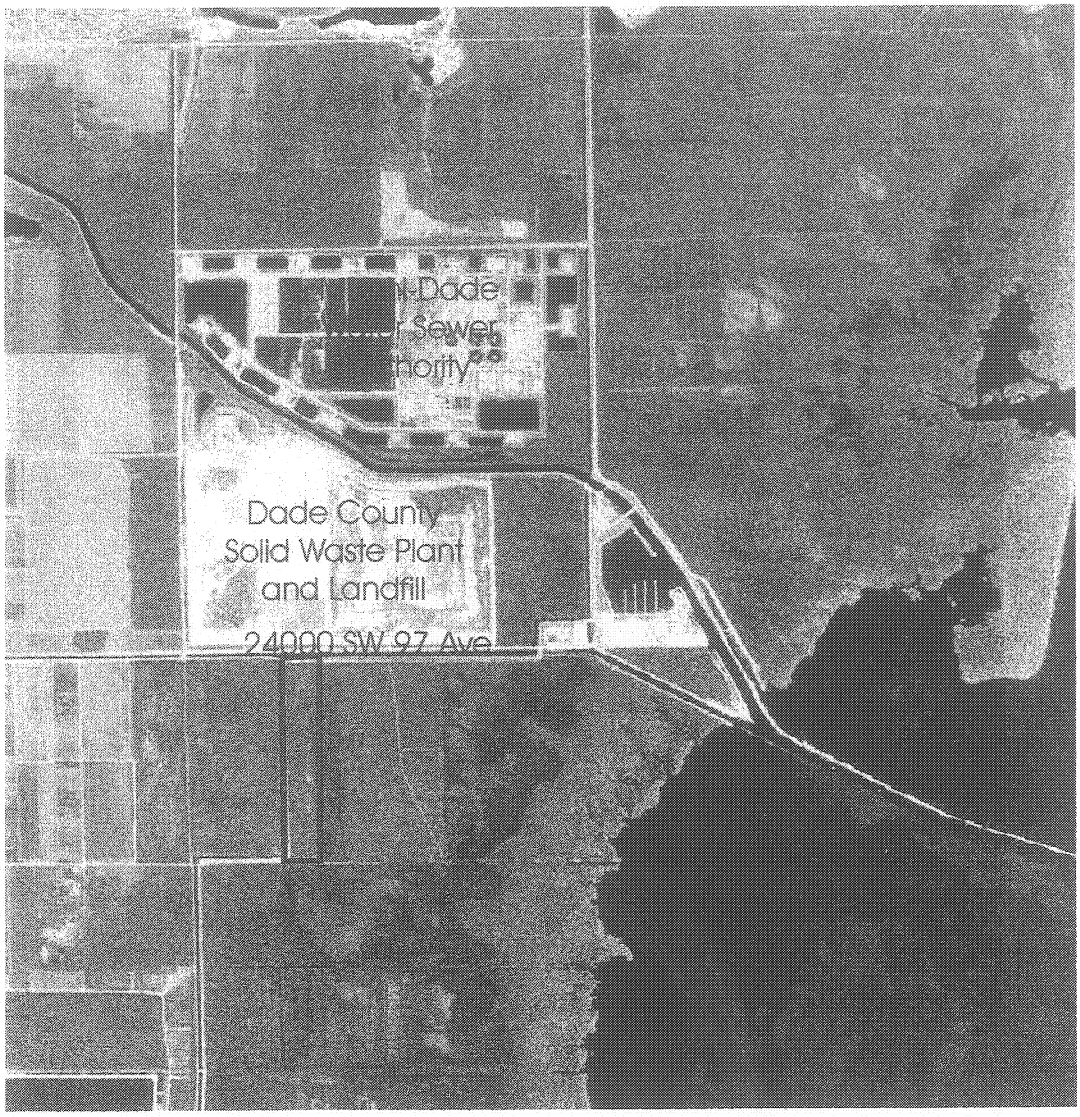
Possible Mitigation Sites

Possible Mitigation Site - ~~Chapman Field~~ Hardy Matheson

Dante B. Fascell Miami-Dade Seaport

FILENAME: W/99-01/graphics/063000.Chapman Field.Hardee Matheson South Tract

Source: The Curtis & Kimball Company, June 2000



South Dade Landfill

Mitigation Option Fact Sheet

Old South Dade Landfill
-Site surveying, 20.9 acres
-Excavation 5' deep of existing material, haul and dump material
-Fill up to 2' entire site with clean material
-Provide new marsh spaced 10' O.C.
-Site maintenance and herbicide treatment for three years
Probable cost: $1,368,308
Cost per acre: $65,500

Legend

Possible Mitigation Site

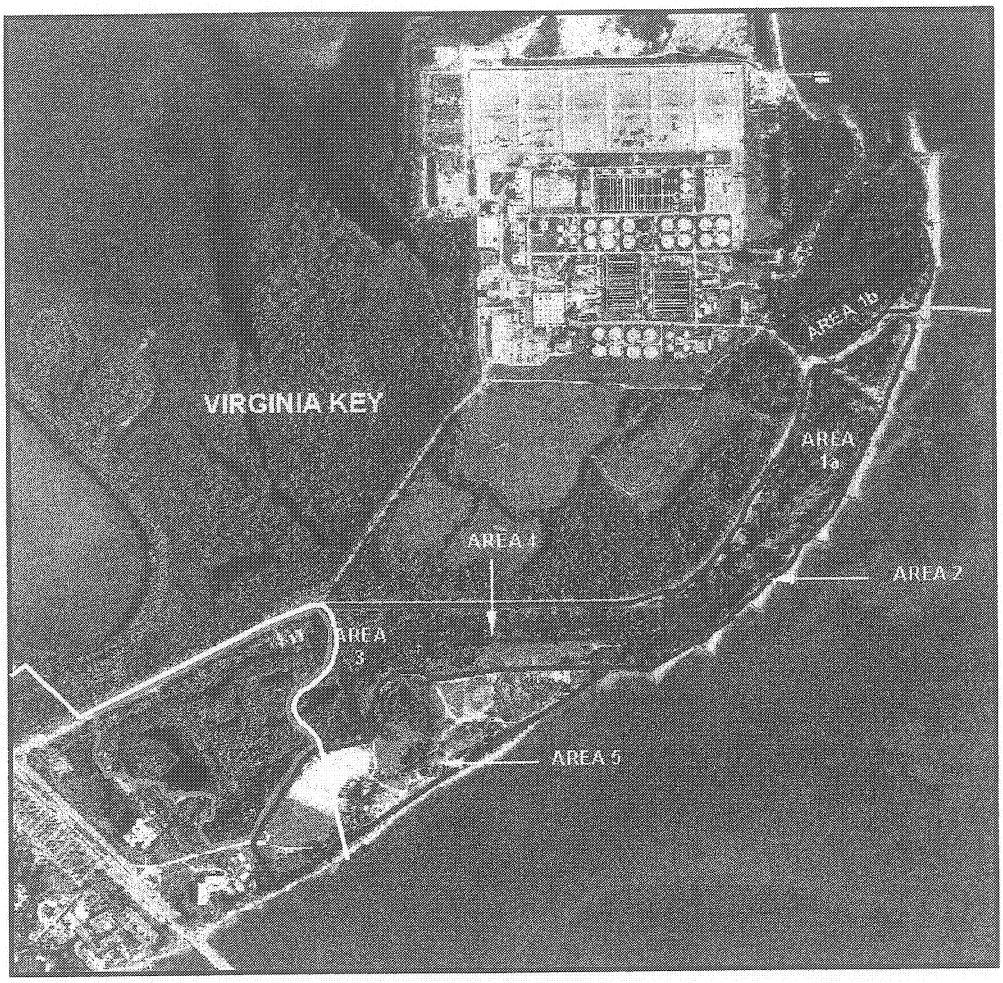
Possible Mitigation Site - South Dade Landfill

Dante B. Fascell Miami-Dade Seaport

FILENAME: W99-01/graphics/063000.South Dade Landfill

Source: The Curtis & Kimball Company, June 2000

FIGURE 4. AREAS CONSIDERED FOR RESTORATION



AREAS 1a & 1b - TROPICAL HARDWOOD HAMMOCK TO BE RESTORED
AREA 2 - TIDAL MANGROVE COMMUNITY TO BE RESTORED
AREA 3 - COASTAL STRAND TO BE RESTORED
AREA 4 - ISOLATED WETLAND TO BE CREATED
AREA 5 - TO BE DETERMINED